Example 4a: Wet Detention Pond with Littoral Zone

Net Improvement Analysis

General Site Information for Project File:

- **Enter a Name for Your Project:** Example #4a
- **Select Meteorological Zone for Project:** Florida Zone 5
- **Enter the Mean Annual Rainfall:** 61 inches
- **Specify Type of Surface Discharge Analysis:** Net Improvement
- **Conduct a Groundwater Discharge Analysis:** No

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
Enter a Name for Your Project: Example #4a
Select Meteorological Zone for Project: Florida Zone 5
Enter the Mean Annual Rainfall: 61 inches
Specify Type of Surface Discharge Analysis: Net Improvement
Conduct a Groundwater Discharge Analysis: No

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
Select Treatment Options for individual performance, not in series or in multiple catchments.

Catchment 1

- Retention Basin
- Greenroof
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined

Tools  Help  Reset All  Catchments  Cost Report  Back

TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM
Permanent Pool Volume (acre-feet): 2.472
Littoral Zones Improvement Credit (%): 10
Floating Wetland or Mats Improvement Credit (%): 0

**Load Diagram for Wet Detention**

Load
N: 33.82 kg/yr
P: 4.45 kg/yr

→ Treatment
N: 46 %
P: 71 %

→ Surface Discharge
N: 18.19 kg/yr
P: 1.27 kg/yr

↓

Mass Reduction
N: 15.63 kg/yr
P: 3.18 kg/yr
Permanent Pool Volume (acre-feet): 2.472
Littoral Zones Improvement Credit (%): 10
Floating Wetland or Mats Improvement Credit (%): 0

Load Diagram for Wet Detention

Load
N: 33.82 kg/yr
P: 4.45 kg/yr

→ Treatment
N: 46 %
P: 71 %

→ Surface Discharge
N: 18.19 kg/yr
P: 1.27 kg/yr

↓
Mass Reduction
N: 15.63 kg/yr
P: 3.18 kg/yr
Load Diagram for Wet Detention

Load
N: 33.82 kg/yr  
P: 4.45 kg/yr

Treatment
N: 46 %  
P: 71 %

Surface Discharge
N: 18.19 kg/yr  
P: 1.27 kg/yr

Mass Reduction
N: 15.63 kg/yr  
P: 3.18 kg/yr
### Single Catchment

<table>
<thead>
<tr>
<th></th>
<th>From</th>
<th>To</th>
<th>Area</th>
<th>BMP Used</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>5.5</td>
<td>Wet Detention</td>
<td>Edit</td>
<td></td>
</tr>
</tbody>
</table>

By using existing and adding new Catchments create a routing configuration. Specify default BMP to be used.
Summary Treatment Report Version: 1.2.3

Project: Example #4a
Date: 1/15/2019

Analysis Type: Net Improvement
BMP Types:
  Catchment 1 - Wet Detention with Littoral Shelf
Routing Summary
  Catchment 1 Routed to Outlet
Total nitrogen target removal met? YES
Total phosphorus target removal met? YES

Summary Report for Outlet:
Nitrogen Loading

Surface Water Analysis

<table>
<thead>
<tr>
<th></th>
<th>Total N pre load</th>
<th>Total N post load</th>
<th>Target N load reduction</th>
<th>Target N discharge load</th>
<th>Percent N load reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.85 kg/yr</td>
<td>33.82 kg/yr</td>
<td>35 %</td>
<td>21.85 kg/yr</td>
<td>46 %</td>
</tr>
<tr>
<td>Provided N discharge load</td>
<td>18.19 kg/yr</td>
<td>40.12 lb/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided N load removed</td>
<td>15.63 kg/yr</td>
<td>34.46 lb/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Phosphorus Loading

Surface Water Analysis

<table>
<thead>
<tr>
<th></th>
<th>Total P pre load</th>
<th>Total P post load</th>
<th>Target P load reduction</th>
<th>Target P discharge load</th>
<th>Percent P load reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.88 kg/yr</td>
<td>4.45 kg/yr</td>
<td>35 %</td>
<td>2.88 kg/yr</td>
<td>71 %</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>1.27 kg/yr</td>
<td>2.8 lb/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>3.18 kg/yr</td>
<td>7.01 lb/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example 4b: Wet Detention Pond + Stormwater Harvesting

Net Improvement Analysis

Select Treatment Options for individual performance, not in series or in multiple catchments.

- Retention Basin
- Greenroof
- Wet Detention
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined
- BMPs in Series

Tools | Help | Reset All | Catchments | Cost Report | Back
Area Available for Irrigation (ac): 3
Harvest Volume (ac-ft): 1
Harvest Rate (0.1 - 4.0 in/week): 0.8

Load Diagram for Stormwater Harvesting

Load:
N: 33.82 kg/yr
P: 4.45 kg/yr

Treatment:
N: 40%
P: 40%

Surface Discharge:
N: 20.27 kg/yr
P: 2.67 kg/yr

Mass Reduction:
N: 13.55 kg/yr
P: 1.78 kg/yr
Select Treatment Options for individual performance, not in series or in multiple catchments.

Catchment 1

- Retention Basin
- Greenroof
- Wet Detention
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined

BMPs in Series

Tools  Help  Reset All  Catchments  Cost Report  Back

TYPICAL X-SECTION OF A WET DETENTION SYSTEM

SHGW = SEASONAL HIGH GROUND WATER TABLE

NWL = THE HIGHER OF:
1. THE NORMAL WET SEASON TAILWATER ELEVATION
2. THE SHGW MINUS SIX (6) INCHES
Multiple BMP Worksheet for Catchment 1

Add up to 4 BMP's to each catchment in order of routing

BMP 1: Wet Detention
BMP 2: Stormwater Harvesting
BMP 3: None
BMP 4: None

Combined Report of all BMP's

- Catchment Area (acres): 5.50
- Watershed Non-DCIA Curve Number: 80.00
- Watershed DCIA Percent: 85.00
- Rainfall Zone: Florida Zone 5
- Calculated Annual Coefficient (0-1): 0.71
- Total (accumulated) Retention Depth (in over watershed): 0.000
- Overall Provided Nitrogen Treatment Efficiency (%): 68
- Overall Provided Phosphorus Treatment Efficiency (%): 83
Enter a Name for Your Project: Example #4a
Select Meteorological Zone for Project: Florida Zone 5
Enter the Mean Annual Rainfall: 61 inches
Specify Type of Surface Discharge Analysis: Net Improvement
Conduct a Groundwater Discharge Analysis: No

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Area</th>
<th>BMP Used</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>5.50</td>
<td>Multiple BMP</td>
<td>Edit</td>
</tr>
</tbody>
</table>

By using existing and adding new Catchments create a routing configuration. Specify default BMP to be used.
Select Treatment Options for individual performance, not in series or in multiple catchments.

- Retention Basin
- Greenroof
- Wet Detention
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined

A - Single Catchment

BMPs in Series

Tools  Help  Reset All  Catchments  Cost Report  Back
Summary Treatment Report Version: 1.2.3

Project: Example #4a

Date: 1/15/2019

Analysis Type: Net Improvement

BMP Types:
- Catchment 1 - Multiple BMP

Total nitrogen target removal met? YES
Total phosphorus target removal met? YES

Routing Summary
- Catchment 1 Routed to Outlet

Summary Report for Outlet:
Nitrogen Loading

<table>
<thead>
<tr>
<th>Surface Water Analysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N pre load</td>
<td>21.85 kg/yr</td>
</tr>
<tr>
<td>Total N post load</td>
<td>33.82 kg/yr</td>
</tr>
<tr>
<td>Target N load reduction</td>
<td>35 %</td>
</tr>
<tr>
<td>Target N discharge load</td>
<td>21.85 kg/yr</td>
</tr>
<tr>
<td>Percent N load reduction</td>
<td>68 %</td>
</tr>
<tr>
<td>Provided N discharge load</td>
<td>10.9 kg/yr 24.04 lb/yr</td>
</tr>
<tr>
<td>Provided N load removed</td>
<td>22.92 kg/yr 50.54 lb/yr</td>
</tr>
</tbody>
</table>

Phosphorus Loading

<table>
<thead>
<tr>
<th>Surface Water Analysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total P pre load</td>
<td>2.88 kg/yr</td>
</tr>
<tr>
<td>Total P post load</td>
<td>4.45 kg/yr</td>
</tr>
<tr>
<td>Target P load reduction</td>
<td>35 %</td>
</tr>
<tr>
<td>Target P discharge load</td>
<td>2.88 kg/yr</td>
</tr>
<tr>
<td>Percent P load reduction</td>
<td>83 %</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>.76 kg/yr 1.68 lb/yr</td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>3.69 kg/yr 8.14 lb/yr</td>
</tr>
</tbody>
</table>
Example 5: Wet Detention Pond in Series With Retention Pond

Specified Removal Efficiency

Nitrogen Removal Efficiency (%): 80
Phosphorus Removal Efficiency (%): 80

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
Example 5: Wet Detention Pond in Series With Retention Pond

**Specified Removal Efficiency**

<table>
<thead>
<tr>
<th>Enter a Name for Your Project:</th>
<th>Example #5 - Wet detention + retention pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Meteorological Zone for Project:</td>
<td>Florida Zone 5</td>
</tr>
<tr>
<td>Enter the Mean Annual Rainfall:</td>
<td>61 inches</td>
</tr>
<tr>
<td>Specify Type of Surface Discharge Analysis:</td>
<td>Specified Removal Efficiency</td>
</tr>
<tr>
<td>Conduct a Groundwater Discharge Analysis:</td>
<td>No</td>
</tr>
</tbody>
</table>

| Nitrogen Removal Efficiency (%) | 80 |
| Phosphorus Removal Efficiency (%) | 80 |

**Steps**

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. **Summary Treatment Report**
5. Cost Comparisons
### Current Catchment Number (use 1 if single catchment):

**1**

#### Land Use

- **Pre:** Undeveloped - Wet Flatwoods: TN=1.213 TP=0.021
- **Post:** Highway: TN=1.520 TP=0.200

#### Catchment Name:

**Highway Section 206**

### Concentrations used in Analysis

<table>
<thead>
<tr>
<th></th>
<th>Pre:</th>
<th>Post:</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC(N) mg/l</td>
<td>1.213</td>
<td>1.520</td>
</tr>
<tr>
<td>EMC(P) mg/l</td>
<td>0.021</td>
<td>0.200</td>
</tr>
<tr>
<td>Annual C</td>
<td>0.157</td>
<td>0.547</td>
</tr>
<tr>
<td>Runoff (ac-ft/yr)</td>
<td>4.789</td>
<td>13.903</td>
</tr>
<tr>
<td>N Loading (kg/yr)</td>
<td>7.162</td>
<td>26.056</td>
</tr>
<tr>
<td>P Loading (kg/yr)</td>
<td>0.124</td>
<td>3.428</td>
</tr>
</tbody>
</table>

#### Additional Information

- **Total Pre-Development Catchment Area (ac):** 6.00
- **Total Post-Development Catchment Area (ac):** 6.00
- **Pre-Development Non DCIA Curve Number:** 80
- **Pre-Development DCIA Percentage (0 - 100%):** 0.0
- **Post-Development Non DCIA Curve Number:** 80
- **Post-Development DCIA Percentage (0 - 100%):** 60.0
- **Wet Pond Area (No loading from this area, ac):** 1.00
Enter a Name for Your Project: Example #5 - Wet detention + re
Select Meteorological Zone for Project: Florida Zone 5
Enter the Mean Annual Rainfall: 61 inches
Specify Type of Surface Discharge Analysis: Specified Removal Efficiency
Conduct a Groundwater Discharge Analysis: No
Nitrogen Removal Efficiency (%): 80
Phosphorus Removal Efficiency (%): 80

1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
Select Treatment Options for individual performance, not in series or in multiple catchments.

- Retention Basin
- Wet Detention
- Exfiltration Trench
- Permeable Pavement
- Stormwater Harvesting
- Surface Water Filtration
- Swale
- BMPs in Series
- Greenroof
- Rainwater Harvesting
- Vegetated Buffer
- Filter or Vegetated Filter Strip
- Rain Garden
- Tree Well
- User Defined

A - Single Catchment
Permanent Pool Volume (acre-feet): 3.809
Littoral Zones Improvement Credit (%): 10
Floating Wetland or Mats Improvement Credit (%): 0

Project: Example #5 - Wet detention + retention in series
Date: 1/17/2019

Wet Detention Design
Permanent Pool Volume (ac-ft) 3.809
Permanent Pool Volume (ac-ft) for 31 days residence 1.181
Annual Residence Time (days) 100
Littoral Zone Efficiency Credit 10
Wetland Efficiency Credit

Watershed Characteristics
Catchment Area (acres) 6.00
Select Treatment Options for individual performance, not in series or in multiple catchments.

Active Catchment: 1

Options:
- Retention Basin
- Greenroof
- Wet Detention
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined

Diagram:
A - Single Catchment

Buttons:
Tools, Help, Reset All, Catchments, Cost Report, Back
Retention System Worksheet Analysis: Specified Removal Efficiency Required Removal N: 80% P: 80%

Provided Retention Depth (in over Catchment): 0.75

Project: Example #5 - Wet detention + retention in series
Date: 1/17/2019

Retention Design
Retention Depth (in) 0.750
Retention Volume (ac-ft) 0.313

Watershed Characteristics
Catchment Area (acres) 6.00
Contributing Area (acres) 5.000
Non-DCIA Curve Number 80.00
DCIA Percent 60.00
Rainfall Zone Florida Zone 5
Rainfall (in) 61.00
Select Treatment Options for individual performance, not in series or in multiple catchments.

- Retention Basin
- Greenroof
- Wet Detention
- Rainwater Harvesting
- Exfiltration Trench
- Vegetated Buffer
- Permeable Pavement
- Filter or Vegetated Filter Strip
- Stormwater Harvesting
- Rain Garden
- Surface Water Filtration
- Tree Well
- Swale
- User Defined

BMPs in Series

Tools  Help  Reset All  Catchments  Cost Report  Back

A - Single Catchment
Multiple BMP Worksheet for Catchment 1

Add up to 4 BMP's to each catchment in order of routing

BMP 1: Retention
BMP 2: Wet Detention
BMP 3: None
BMP 4: None

Open
Open

Calculate
Print
Copy
Back
Enter a Name for Your Project: Example #5 - Wet detention + re
Select Meteorological Zone for Project: Florida Zone 5
Enter the Mean Annual Rainfall: 61 inches
Specify Type of Surface Discharge Analysis: Specified Removal Efficiency
Conduct a Groundwater Discharge Analysis: No
Nitrogen Removal Efficiency (%): 80
Phosphorus Removal Efficiency (%): 80

3. Configure Catchments

Buttons:
Open Project, New Project, Save Project, Exit BMPTrains

Steps:
1. Enter Catchment
2. Enter Treatment
4. Summary Treatment Report
5. Cost Comparisons
<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Area</th>
<th>BMP Used</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>6.00</td>
<td>Multiple BMP</td>
<td>Edit</td>
</tr>
</tbody>
</table>

By using existing and adding new Catchments create a routing configuration. Specify default BMP to be used.
Enter a Name for Your Project: Example #5 - Wet detention + re
Select Meteorological Zone for Project: Florida Zone 5
Enter the Mean Annual Rainfall: 61 inches
Specify Type of Surface Discharge Analysis: Specified Removal Efficiency
Conduct a Groundwater Discharge Analysis: No
Nitrogen Removal Efficiency (%): 80
Phosphorus Removal Efficiency (%): 80

Open Project New Project
Save Project Exit BMPTrains
1. Enter Catchment
2. Enter Treatment
3. Configure Catchments
4. Summary Treatment Report
5. Cost Comparisons
Summary Treatment Report Version: 1.2.3

Project: Example #5 - Wet detention + retention in series

Date: 1/17/2019

Analysis Type: Specified Removal Efficiency
BMP Types:
  Catchment 1 - Multiple BMP

Total nitrogen target removal met? YES
Total phosphorus target removal met? YES

Routing Summary
Catchment 1 Routed to Outlet

Summary Report for Outlet:
Nitrogen Loading

<table>
<thead>
<tr>
<th>Surface Water Analysis</th>
<th>Phosphorus Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N pre load</td>
<td>.12 kg/yr</td>
</tr>
<tr>
<td>Total N post load</td>
<td>7.16 kg/yr</td>
</tr>
<tr>
<td>Total P pre load</td>
<td>26.06 kg/yr</td>
</tr>
<tr>
<td>Total P post load</td>
<td>80%</td>
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<tr>
<td>Target N load reduction</td>
<td>.12 kg/yr</td>
</tr>
<tr>
<td>Target P load reduction</td>
<td>5.21 kg/yr</td>
</tr>
<tr>
<td>Percent N load reduction</td>
<td>80%</td>
</tr>
<tr>
<td>Percent P load reduction</td>
<td>.69 kg/yr</td>
</tr>
<tr>
<td>Provided N discharge load</td>
<td>80%</td>
</tr>
<tr>
<td>Provided N load removed</td>
<td>5.1 kg/yr</td>
</tr>
<tr>
<td>Provided N discharge load</td>
<td>11.25 lb/yr</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>20.95 kg/yr</td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>5.1 kg/yr</td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>46.2 lb/yr</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>3.17 kg/yr</td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>.26 kg/yr</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>.57 lb/yr</td>
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<tr>
<td>Provided P load removed</td>
<td>3.17 kg/yr</td>
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<td>Provided P load removed</td>
<td>.26 kg/yr</td>
</tr>
<tr>
<td>Provided P discharge load</td>
<td>.57 lb/yr</td>
</tr>
<tr>
<td>Provided P load removed</td>
<td>6.99 lb/yr</td>
</tr>
</tbody>
</table>